

Note 5A • Using Matrices to Solve Systems

This calculator has a built-in routine to convert a matrix into its equivalent solution form. Enter as MATRIX [A] the matrix that represents the system of equations you wish to solve. Note that this matrix must have one more column than its number of rows; for example, its dimensions might be 2×3 , 3×4 , or 7×8 . In the Home screen, press $\boxed{2\text{nd}} \boxed{\text{MATRIX}}$, select [MATH], and select $\boxed{\text{B:rref(}}$. Then press $\boxed{2\text{nd}} \boxed{\text{MATRIX}} \boxed{1} \boxed{([A])} \boxed{\text{ENTER}}$. (On the TI-83, press $\boxed{\text{MATRX}}$ for the matrix menu.)

As an example consider the system
$$\begin{cases} 2x + y = 1 \\ 3x - 2y = 19 \end{cases}$$

```
NAMES MATH 000
1:[A]
2:[B]
3:[C]
4:[D]
5:[E]
6:[F]
7:[G]
```

```
MATRIX[A] 2 x3
[[ 2  1 19]
 [ 3 -2 19]]
z, z=19
```

```
NAMES 000 EDIT
0: cumSum(
1: ref(
2: rref(
3: rowSwap(
4: row+(
5: *row(
6: *row+(
```

```
[A]
[[ 2  1  1]
 [ 3 -2 19]]
rref([A])
[[ 1  0  3]
 [ 0  1 -5]]
```

The solution to the system is $x = 3$ and $y = -5$.

Note 5B • Inequality Symbols

This calculator can test or evaluate an expression to determine whether it is true or false. This is called a Boolean test, after the mathematician Charles Boole. To find the equality and inequality symbols, press $\boxed{2\text{nd}} \boxed{\text{TEST}}$. An expression is evaluated as 0 if it is false and as 1 if it is true.

```
TEST LOGIC
1:=
2:+
3:-
4:>
5:<
6:~
```

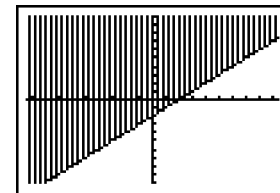
```
7>4      1
4>7      0
```

Note 5C • Graphing Inequalities in Two Variables

This calculator can graph an inequality in two variables by shading the screen above or below the graph of an equation. Enter an equation into the Y= screen. Then, in that same line, move the cursor as far left as it will go and press $\boxed{\text{ENTER}}$. Each time you press $\boxed{\text{ENTER}}$, the graph style changes and is indicated by the flashing cursor. To see the graph, press $\boxed{\text{GRAPH}}$.

To graph the inequality $y \geq -2 + x$, enter the equation for the line $Y_1 = -2 + x$ into the Y= screen. Then, move the cursor to the left of Y_1 and press $\boxed{\text{ENTER}}$ to set the graph style to shade the portion of the screen above the line. Finally, press $\boxed{\text{GRAPH}}$.

```
Plot1 Plot2 Plot3
Y1=-2+X
Y2=
Y3=
Y4=
Y5=
Y6=
Y7=
```



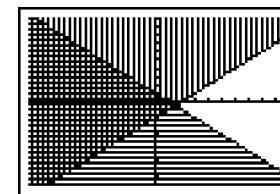
$[-10, 10, 1, -10, 10, 1]$

You can graph a system of inequalities by graphing two (or more) inequalities on the same screen.

To graph the system of inequalities
$$\begin{cases} y \geq -2 + x \\ y \leq 1 - x \end{cases}$$

graph the first inequality as previously shown. Then, enter the equation for the line $Y_2 = 1 - x$ into the Y= screen. Move the cursor all the way to the left and press $\boxed{\text{ENTER}} \boxed{\text{ENTER}} \boxed{\text{ENTER}}$ to set the graph style to shade the portion of the screen below the line. Finally, press $\boxed{\text{GRAPH}}$.

```
Plot1 Plot2 Plot3
Y1=-2+X
Y2=1-X
Y3=
Y4=
Y5=
Y6=
Y7=
```

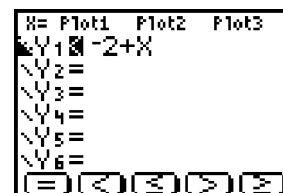
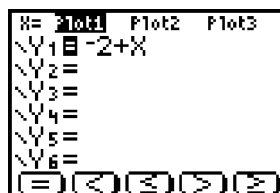
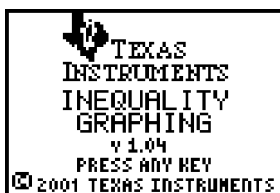


$[-10, 10, 1, -10, 10, 1]$

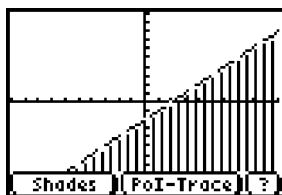
Note 5C/App • Graphing Inequalities Using the Inequalz App

An inequality graphing application is available for the TI-83 Plus and TI-84 Plus. It comes preloaded on the TI-84 Plus, and can be downloaded for the TI-83 Plus. Once you have the application on your calculator, follow these steps to use it.

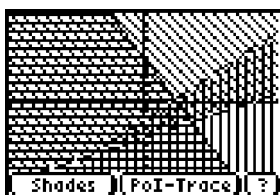
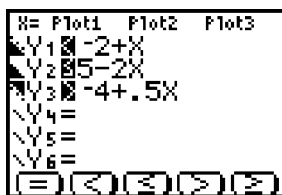
Press **[APPS]**, scroll down to :Inequalz, and press **[ENTER]**. Press any key to continue. Enter an expression and move onto the equals symbol. You'll see five choices, $=$, $<$, \leq , $>$, and \geq , appear at the bottom of the screen. Press **[ALPHA]** then one of the five keys in the top row of your calculator to select the equality or inequality key you want. (For example, press **[ALPHA]** **[F2]** to choose $<$.)



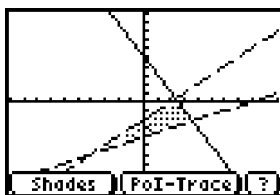
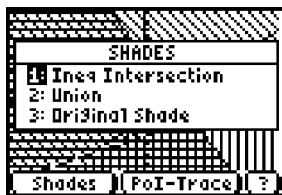
Press **[GRAPH]** to graph the equation or inequality.



The Inequalz App is particularly useful if you want to graph the solution to a system of inequalities. For example, three inequalities are graphed here. It is not easy to identify the solution region.



To shade only the solution region, press **[ALPHA]** **[F1]** to select Shades. Select 1:Ineq Intersection. Now only the solution region—the region where all three inequalities intersect—is shown.



When finished graphing inequalities, quit the application by pressing **[APPS]**, scrolling down to :Inequalz, pressing **[ENTER]**, and selecting 2:Quit Inequal.